Prominence
RF-20A/20Axs

Shimadzu
Fluorescence Detector for
High Performance Liquid Chromatography
RF-20A/20Axs Fluorescence Detectors
World-Leading Sensitivity* Meets Diverse Needs

The excellent basic performance of the Prominence series is further enhanced by the RF-20A/20Axs fluorescence detectors, which offer world-leading sensitivity*, excellent ease of maintenance, and validation support functions. They support a wide range of applications from conventional analysis to ultra fast analysis.

Achieves World-Leading Sensitivity*

Thanks to a newly designed optical system, the RF-20A/20Axs offer world-leading levels of sensitivity*. A water Raman S/N ratio of at least 2000 for RF-20Axs or 1200 for RF-20A makes these detectors powerful tools for analysis that demands the detection of trace-level components.


Ultra-High-Sensitivity Analysis of Anthracene (RF-20Axs)

An S/N ratio of 21.5 was achieved for an injection of 10.48 fg anthracene (RF-20Axs). This is equivalent to approx. 1.5 fg limit of detection (S/N ratio = 3), which is excellent sensitivity.

Cell Temperature Control Further Enhances Reproducibility (RF-20Axs)

The fluorescence intensity drops as the temperature rises. A fluctuation of about 1°C near room temperature may result in approximately 5% intensity fluctuations for some compounds.

RF-20Axs features a temperature-controlled cell with a cooling function. It maintains a constant detector cell temperature, even if the room temperature fluctuates significantly, to ensure superb reproducibility with no drop in sensitivity.

Effect of Temperature-Controlled Cell

Without temperature control, the peak area value dropped approximately 17% due to the increase in cell temperature when the room temperature changed from 25°C to 30°C. Good accuracy could not be obtained, with reproducibility of 6.3% RSD (n=6).

RF-20Axs incorporates a temperature-controlled cell to ensure excellent reproducibility with respect to such fluctuations in room temperature.

Analytical Conditions

**Analytical Conditions**

<table>
<thead>
<tr>
<th>Mobile phase</th>
<th>Water / acetonitrile = 30 / 70 (v/v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow rate</td>
<td>0.6 mL/min</td>
</tr>
<tr>
<td>Column</td>
<td>Shim-pack XR-ODS (2.0 mm x 50 mm, 2.2 μm)</td>
</tr>
<tr>
<td>Temperature</td>
<td>40°C</td>
</tr>
<tr>
<td>Detection</td>
<td>250 nm excitation wavelength, 400 nm emission wavelength</td>
</tr>
</tbody>
</table>

**High-Sensitivity Analysis of Anthracene**

- **RF-20Axs** (With cell temperature control) - Rate of Change (%): 0.64; %: 0.29
- **RF-20A** (No cell temperature control) - Rate of Change (%): -17.45; %: 6.30

**Rate of Change**

Consecutive analyses are performed at 25°C and 30°C room temperature. The rate of change shows the change in the peak area, taking the average peak area value at 25°C as 1. It is used to confirm the effect of long-term fluctuations in room temperature due to the passage of the seasons.

%RSD

Consecutive analysis is performed while changing the room temperature from 25°C to 30°C, and the %RSD value is determined from the analysis data (n=6). It is used to confirm the effect of room-temperature fluctuations during the analysis.
Support for Ultra Fast Analysis

Switch from Conventional LC to Ultra Fast LC

Fast response is required to follow the sharp peaks obtained in ultra fast LC analysis. The 10 ms response of the RF-20A/20Axs permits ultra fast LC analysis with no loss of separation. In this analysis example, the analysis time was reduced by a factor of more than three, while maintaining the separation.

Conventional LC Conditions
- Mobile phase: Hexane / 2-propanol = 100 / 0.5 (v/v)
- Flow rate: 1.0 mL/min
- Column: Shim-pack CLC-SIL(M) (4.6 mmID. x 150 mmL, 5 μm)
- Temperature: 30°C
- Detection: 298 nm excitation wavelength, 325 nm emission wavelength

UFLC Conditions
- Mobile phase: Hexane / 2-propanol = 100 / 0.5 (v/v)
- Flow rate: 0.8 mL/min
- Column: Shim-pack XR-SIL (3 mmID. x 75 mmL, 2.2 μm)
- Temperature: 30°C
- Detection: 298 nm excitation wavelength, 325 nm emission wavelength

Multi-Component, High-Sensitivity UFLC Analysis

The highly sensitive simultaneous analysis of multiple components requires detection at the optimal wavelengths. The RF-20A/20Axs permit ultra fast, high-sensitivity multi-component analysis using wavelength switching by time program.

Analytical Conditions
- Mobile phase: Water / acetonitrile = A / B (gradient)
- Gradient: B Conc. = 50% (0-0.5min), 50-88% (0.5-3.0min), 88% (3.0-4.2min), 100% (4.2-4.5min), 50% (4.51-5.0min)
- Flow rate: 3.0 mL/min
- Column: SUPELCOSIL LC-PAH (4.6 mmID. x 50 mmL, 3 μm)
- Temperature: 40°C
- Detection: Excitation/emission wavelengths switched in each interval (see table to right)

<table>
<thead>
<tr>
<th>Component</th>
<th>Excitation/ Emission Wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>270 nm excitation, 330 nm emission</td>
</tr>
<tr>
<td>B</td>
<td>250 nm excitation, 370 nm emission</td>
</tr>
<tr>
<td>C</td>
<td>330 nm excitation, 430 nm emission</td>
</tr>
<tr>
<td>D</td>
<td>270 nm excitation, 390 nm emission</td>
</tr>
<tr>
<td>E</td>
<td>290 nm excitation, 430 nm emission</td>
</tr>
<tr>
<td>F</td>
<td>370 nm excitation, 460 nm emission</td>
</tr>
<tr>
<td>G</td>
<td>270 nm excitation, 330 nm emission</td>
</tr>
</tbody>
</table>
Maintenance and Validation

Easy Maintenance for Ease of Use

RF-20A/20Axs offer excellent ease-of-use as well as superb performance.

Maintenance from Front Panel
The Xenon lamp and flow cell can be replaced at the front panel.
No positional adjustment is required when replacing the Xenon lamp.
No tools are required to replace the flow cell. The standard flow cell or semimicro flow cell can be rapidly switched.

Long-Life Lamp Reduces Running Costs
The Xenon lamp life is extended to 2000 hours, four times longer than previous Shimadzu lamps.
This significantly reduces running costs and down-time due to maintenance.

Validation Functions Provide Powerful Support for Daily Analysis Tasks

RF-20A/20Axs offer comprehensive validation functions.
In addition to the VP functions familiar from the Prominence series, RF-20Axs features an automatic wavelength check to enhance the reliability of the analysis data.

Automatic Wavelength Checks Maintain the Optimal Detector Condition (RF-20Axs)
RF-20Axs incorporates an automatic wavelength accuracy check function using an internal low-pressure mercury lamp.
It provides simple confirmation of the wavelength accuracy for validation.

Simple Wavelength Calibration (RF-20Axs)
If a wavelength displacement is discovered in the RF-20Axs during the system check, it can be easily corrected using the calibration menu.
It is not necessary to provide a separate low-pressure mercury lamp each time the check is conducted.

Simple Output of System Check Reports
Simple operations from the workstation permit all tasks from conducting the system check to printing the report.
The system check automatically checks all items essential for instrument management, such as the lamp lit time and wavelength accuracy (RF-20Axs).
The system check results are automatically saved in the analysis data acquired by the detector to allow confirmation of the instrument status at the time the data was acquired and to further enhance the reliability of the analysis data.

The system check can be run with just a few mouse clicks. The system check results can be extracted from the analysis data and compiled into a report.
A range of application systems is available that combines the great expandability of the Prominence series with the high RF-20A/20Axs sensitivity. These systems offer high accuracy and reliable data acquisition.

**Amino Acid Analysis System**

This is an automatic amino acid analysis system that uses the post-column fluorescence derivatization method with o-phthalaldehyde (OPA)/N-acetylcysteine as reaction reagents. This system adopts Shimadzu’s unique method using N-acetylcysteine (odorless solid) as a thiol-based reaction promoter. This is easier to handle than the conventional method using mercaptoethanol and enhances the sensitivity for imino acids, such as proline. Mobile phases and reaction reagents are available as kits to eliminate troublesome solution preparation.

**Reducing Sugar Analysis System**

This is an automatic reducing sugar analysis system that uses Shimadzu’s unique post-column fluorescence derivatization method with arginine as the reaction reagent. It is a highly sensitive and selective method for analyzing reducing sugars in samples containing many impurity components.

**Carbamate Pesticide Analysis System**

This is an automatic N-methyl carbamate pesticide analysis system that uses the post-column fluorescence derivatization method with o-phthalaldehyde (OPA) as the reaction reagent. It is an accurate method for analyzing N-methyl carbamate pesticides in foods and tap water.
## Specifications

<table>
<thead>
<tr>
<th></th>
<th>RF-20A (228-45147-XX)</th>
<th>RF-20Axs (228-45148-XX)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light Source</strong></td>
<td>Xenon lamp</td>
<td>Xenon lamp, low-pressure mercury lamp (to check wavelength accuracy)</td>
</tr>
<tr>
<td><strong>Wavelength Range</strong></td>
<td>0, 200 nm to 650 nm</td>
<td>0, 200 nm to 750 nm</td>
</tr>
<tr>
<td><strong>Spectral Bandwidth</strong></td>
<td>20 nm</td>
<td></td>
</tr>
<tr>
<td><strong>Wavelength Accuracy</strong></td>
<td>± 2 nm</td>
<td>± 0.2 nm</td>
</tr>
<tr>
<td><strong>Wavelength Reproducibility</strong></td>
<td>± 0.2 nm</td>
<td></td>
</tr>
<tr>
<td><strong>Cell (capacity, pressure resistance, material)</strong></td>
<td>12 μL; 2 MPa (approx. 20 kgf/cm²; SUS316L, PTFE, fluororesin, quartz</td>
<td>12 μL; 2 MPa (approx. 20 kgf/cm²; SUS316L, PTFE, fluororesin, quartz</td>
</tr>
<tr>
<td><strong>Cell Temperature Input Range</strong></td>
<td>—</td>
<td>4°C to 40°C, 1°C step</td>
</tr>
<tr>
<td><strong>Cell Temperature Control Range</strong></td>
<td>—</td>
<td>(Room temperature -10°C) to 40°C, 0.5°C/min. max. flow rate, 85°C max. oven temperature)</td>
</tr>
<tr>
<td><strong>Simultaneous Monitoring Of 2 Wavelengths</strong></td>
<td>Measured wavelength: Any two wavelengths between 200 and 650 nm</td>
<td>Measured wavelength: Any two wavelengths between 200 and 650 nm</td>
</tr>
<tr>
<td><strong>Sampling period</strong></td>
<td>0.5 s per wavelength</td>
<td></td>
</tr>
<tr>
<td><strong>Operational Ambient Temperature Range</strong></td>
<td>4°C to 35°C</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions/Weight</strong></td>
<td>W260 x H210 x D420 mm, 16 kg</td>
<td>W260 x H210 x D420 mm, 18 kg</td>
</tr>
</tbody>
</table>

## Options

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Part No.</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature-Controlled Flow Cell for Semimicro LC</td>
<td>228-51950-91</td>
<td>Cell capacity: 3 μL. Supports temperature control (RF-20Axs only). Contact materials: SUS316L, PTFE, quartz</td>
</tr>
<tr>
<td>Flow Cell for Inert LC</td>
<td>228-51951-91</td>
<td>Plastic flow cell with non-metal liquid-contact parts. Cell capacity: 12 μL. Temperature control: not supported. Contact materials: PEEK, PTFE, quartz</td>
</tr>
<tr>
<td>Photomultiplier R928-08</td>
<td>200-75021</td>
<td>Replacing the photomultiplier with this option extends the measurement wavelength range to 200 nm to 900 nm</td>
</tr>
<tr>
<td>Photomultiplier R3788</td>
<td>200-5031</td>
<td>For RF-20A (supplied as standard with RF-20Axs). Replacing the photomultiplier with this option extends the measurement wavelength range to 200 nm to 750 nm.</td>
</tr>
</tbody>
</table>